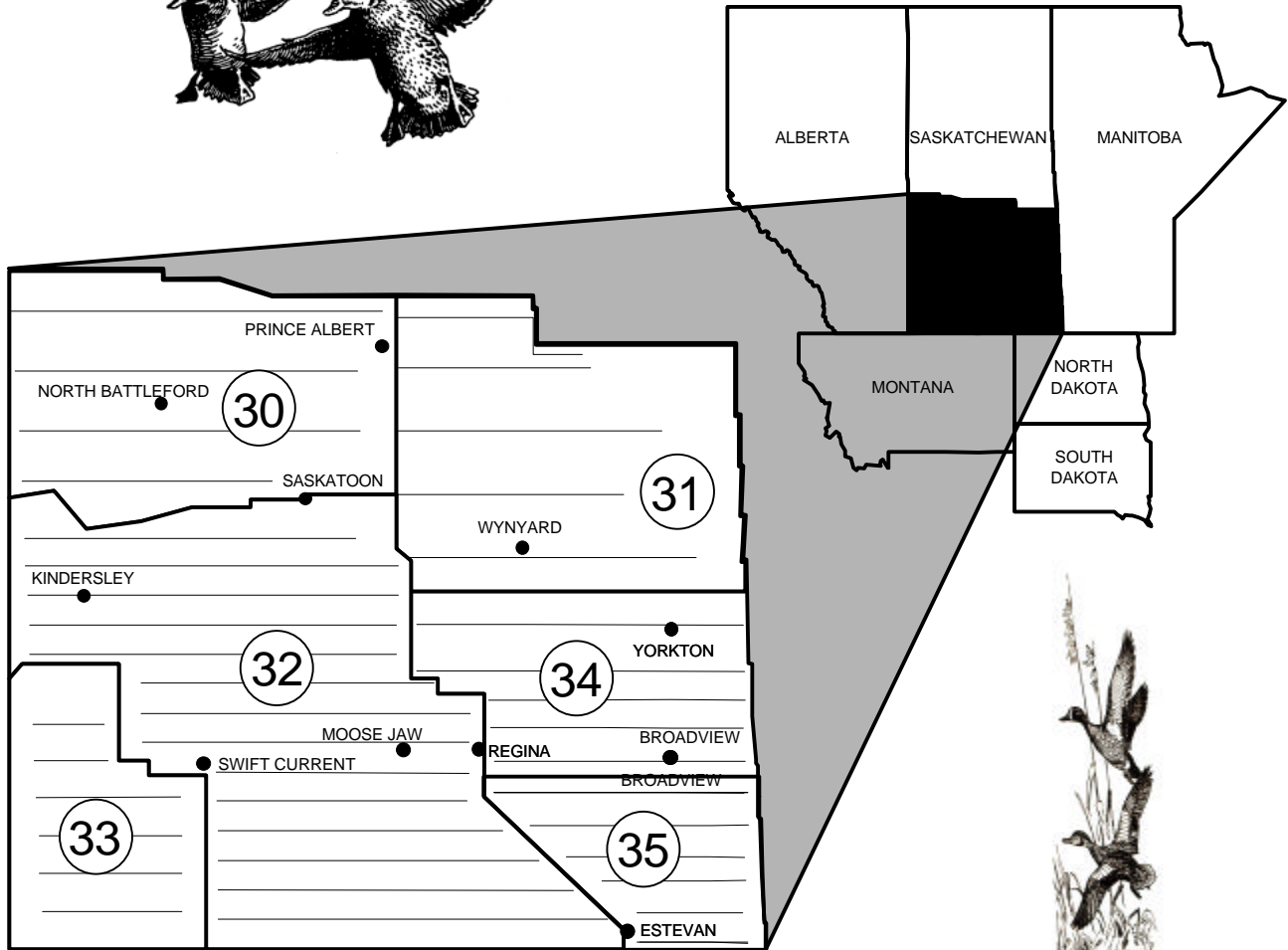
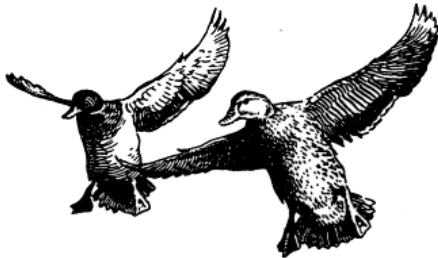


WATERFOWL BREEDING POPULATION SURVEY

SOUTHERN SASKATCHEWAN

2002



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

AND

ENVIRONMENT CANADA
CANADIAN WILDLIFE SERVICE



TITLE: Waterfowl Breeding Population Survey for Southern Saskatchewan

STRATA SURVEYED: 30, 31, 32, 33, 34, and 35

DATES: May 13 – May 31, 2002

DATA SUPPLIED BY: United States Fish and Wildlife Service (USFWS)
Canadian Wildlife Service (CWS)

Strata 30, 31, 32, and 33

Aerial Crew

Pilot/Observer
Observer

Philip Thorpe, Flyway Biologist, USFWS
Herb Bell, Wildlife Biologist, USFWS

Ground Crew

Crew Leaders:

Dan Nieman, Wildlife Biologist, CWS
Jack Smith, Wildlife Technician, CWS
Keith Warner, Wildlife Technician, CWS

Assistants:

Chris Downie, Student Technician, CWS
David Johns, Student Technician, CWS
Phyllis Nieman, Volunteer, CWS
Chad Park, Student Technician, CWS
Amanda Williams, Student Technician, CWS

Strata 34 and 35

Aerial Crew

Pilot/Observer:
Pilot/Observer:

Rod King, Flyway Biologist, USFWS
Karen Bollinger, Flyway Biologist, USFWS

Ground Crew

Crew Leaders:

Dale Caswell, Wildlife Biologist, CWS
Pat Rakowski, Wildlife Biologist, CWS
Jim Leafloor, Wildlife Biologist, CWS
Marc Schuster, Wildlife Technician, CWS
Jason Caswell, Wildlife Technician, CWS
Cory Lindgren, Wildlife Technician, Ducks Unlimited Canada

Assistants:

James Galbraith, Student Technician, CWS
Frank Baldwin Jr., Student Technician, CWS
Alain Dupuis, Student Technician, CWS
Ted Barney, Student Technician, CWS

ABSTRACT: The 2002 Waterfowl Breeding Population and Habitat Survey of Southern Saskatchewan was conducted 13 May to 31 May and was consistent in design and coverage to previous years. Severe drought has negatively impacted wetland and upland conditions across most of the survey area. The May pond estimate was down 58.7% from the 2001 estimate, 69.6% from the 10-year mean, and 68.1% from the long-term mean. The total duck population estimate (3,550,300) decreased 45.1%, 52.0%, and 52.1% from 2001, the 10-year mean, and the long-term mean, respectively. Percent changes for selected species compared to 2001, the 10-year mean, and the long-term mean are as follows: mallards, -26.5%, -36.2%, -42.4%; northern pintail, -73.3%, -72.2%, -85.7%; blue-winged teal, -47.4%, -54.3%, -44.8%; canvasbacks, -68.5%, -65.4%, -60.7%; scaup (greater and lesser), -53.3%, -60.5%, -65.3%. Nest success and recruitment for all species out of southern Saskatchewan is expected to be poor because of the poor habitat conditions.

METHODS: The procedures used in conducting this year's annual survey are described in the Standard Operating Procedures for Aerial Waterfowl Breeding Population and Habitat Surveys in North America Section III (A), (revised 1987). No changes were made this year in survey methodology or aerial coverage in strata 30-33 (Table 1). The crew and aircraft used to survey southeast Saskatchewan were involved in an aircraft accident on 27 May. Although most of the data was backed up, some of the data for strata 34-35 was lost in the accident. Survey design was adjusted to make up for the reduced coverage (Table 1). Improved backup plans for data have been implemented for future surveys.

A survey program, written by John I. Hodges (USFWS-Alaska), provided the basis for recording observations and transcribing the data into electronic format. This software integrates point locations {from the aircraft Global Positioning System unit (GPS)} with each bird or pond observation (See Thorpe 2000 for a more detailed description of the survey program).

Air-ground comparison transects (35 in strata 30-33; 16 in strata 34-35) were used to provide visibility correction factors for waterfowl, coot, and pond numbers. The following air-grounds with their associated strata were not completed by the ground crew because of personnel shortages: Environ, 30; Waldheim, 30; Elfros, 31; Hendon, 31; Grand Coulee 32; Gravelbourg, 32; Kincaid, 32; Neidpath, 32; Eastend, 33. In addition, Midnight Lake (30), Peterson (31), and Lawson (32) air-grounds were shortened from 17 miles to 11 miles, 18 miles to 8 miles, and 18 miles to 10 miles, respectively. All air-grounds were completed in strata 34 and 35.

Minor aerial crew changes occurred in strata 30-35. Herb Bell, who observed in 34-35 in 2001, returned to strata 30-33 as observer and Karen Bollinger, who pilot/observed in 30-33 in 2001, moved to 34-35 as a pilot/observer. Personnel changes were also made in both ground crews (i.e., one new assistant in 30-33 and 4 new crew members in 34-35), but key crew leaders remained the same. All new personnel were provided initial training in duck identification, pond classification, and survey procedures. All were closely monitored for accuracy in identification and compliance with established procedures throughout the survey.

The survey was initiated 13 May and was completed 31 May. Two Cessna 206s (one on amphibian floats in strata 34-35) were used as survey aircraft this year in all strata. Approximately 69 and 23 hours of flight time were required to complete the survey within strata 30-33 and strata 34-35, respectively. Weather related delays amounted to 1 day and 4 days in strata 30-33 and strata 34-35, respectively.

WEATHER AND HABITAT CONDITIONS: Wetland habitat was in extremely poor condition over the entire survey area and the majority of wetland basins were dry during the survey. No ephemeral or temporary wetlands (i.e. sheetwater) were observed and very few seasonal or semi-permanent basins held water during the survey period. Basins that held water were severely drawndown.

During the winter, the west, northwest, and northeast parts of the survey area received well-below average precipitation. The rest of the survey area received below average precipitation. Below average precipitation and above average temperatures ($>3-5^{\circ}\text{C}$) during the winter resulted in little to no runoff this spring (Sask Water 2002, Agriculture and Agri-food Canada 2002). March was the exception with temperatures $6-8^{\circ}\text{C}$ below average over most of the survey area, however, precipitation was still well-below average for the month.

Record setting dry conditions predominated during April and May with the driest conditions located in the central and northern parts of the survey area ($<40\%$ of average precipitation). Precipitation in the southwest and south-central regions was 60-85% below average during April and May. Remaining parts of the survey area were 40-60% below average (Agriculture and Agri-food Canada 2002). Although temperatures in April were about average, May was characterized by below average temperatures and by several snow events in the southern sections of the Province. June rains brought some drought relief to the southern grasslands and actual flooding to the southwest corner of the Province but the central grasslands and Parklands remained dry.

During May, the majority (55 - 100%) of the survey area's topsoil, hay, and pastureland were rated as poor (Report #7, Saskatchewan Agriculture and Food 2002). Residual cover was sparse because of below average precipitation during the 2001 growing season; nesting cover for early nesting species was limited. The cool, dry spring also delayed grass and fall seeded crop growth further limiting nesting cover. By mid-June, livestock were still being fed because of the delayed grass growth.

The May pond estimate (634,900) was 58.7% down from the 2001 estimate (1,535,700), 69.6% down from the 10-year mean, and 68.1% down from the long-term mean (Table 3, Figure 1). Overall, the 2002 May pond estimate was the second lowest since 1981. The Parkland strata in the southeast, northeast, and northwest (strata 30, 31, and 35) were most affected by the below average precipitation and pond estimates from these strata were the lowest on record. Wetland estimates in the southwest grasslands were up 63.2% from last year; these increases were primarily in the Cypress Hills and the grasslands to the south of the Hills towards the U. S. border. Although improvement was seen in the southwest, the remainder of the grassland wetland habitat in southern Saskatchewan, including the Missouri Coteau, was well below last year, the 10-year mean, and the long-term mean (see stratum 32 in Table 3).

Potential brood habitat during the survey was considered poor across most of the survey area. Primarily due to limited wet basins and drawndown basins that will not provide broods with adequate food resources or protective cover.

BREEDING POPULATION ESTIMATES: The total duck population estimate for southern Saskatchewan decreased 45.1% from the 2001 estimate, 52.0% from the 10-year mean, and 52.1% from the long-term mean and was the third lowest duck population estimate since 1955 (Table 3). The total dabbling duck population estimate decreased 43.9% from 2001 and was the fourth lowest estimate on record (Table 3, Appendix 1). The 2002 mallard population estimate decreased 26.5% from the 2001 estimate and remains below the 10-year and long-term means

(Table 3). The blue-winged teal estimate was down 47.4%, 54.3%, and 44.8% from the 2001 estimate, the 10-year mean, and the long-term mean, respectively. The 2002 northern pintail estimate was also down substantially from the 2001 estimate, the 10-year mean, and the long-term mean and was the second lowest estimate on record (Table 3, Appendix 1). The American wigeon estimate was the third lowest estimate on record and was 60.7% below the long-term mean (Table 3, Appendix 1).

The total diving duck population estimate was down 50.1% compared to the 2001 estimate (Table 3). The 4 species in the genus *Aythya* that are surveyed were below 2001 estimates and their respective 10-year means. The canvasback estimate was the lowest on record, the scaup estimate was the second lowest on record, and the redhead estimate was the fourth lowest on record (Appendix 1).

The American coot estimate was down 54.8% from the 2001 estimate, not surprising given the lack of suitable wetland habitat in the survey area (Table 3). The Canada goose estimate remained about the same for the third year in a row and ranked as the fifth highest estimate on record (Appendix 1).

CONCLUSIONS: The drought continued in southern Saskatchewan with record low pond counts in many of the survey strata and some of the lowest waterfowl population estimates in 20 years. Droughts have numerous affects on waterfowl populations. Avoidance of the affected area (i.e. overflights) and species forgoing breeding and nesting are two well-documented phenomena that occur during drought periods in the prairies (Bluhm 1992). Some species and groups of species adapt better to dry cycles than others do. Dabbling ducks tend to be better adapted to wetlands that are more ephemeral in nature than diving ducks and therefore adapt better to changing water regimes. For example, northern pintails are well known for their overflights of the grasslands when they are dry; moving to the boreal forests of northern Canada and Alaska. Lower pintail estimates in the 1960s and late 1980s reflect the droughts during those periods and the corresponding overflight of pintails to the north (Figure 1). Reports from northern Saskatchewan and northern Manitoba this year indicate that pintails did show up in larger numbers along with other species of both dabbling and diving ducks.

Unlike dabbling ducks, diving ducks don't respond as well to drought and, although they will disperse to areas of better habitat, nest success is generally lower (Bluhm 1992). This year, canvasback, scaup, and redhead estimates were the lowest since the 1960s. These species rely on the stable semi-permanent and permanent wetlands of the Parklands. Most of the Parkland strata had record-low pond estimates and the remaining ponds were drawdown. Nesting and production of diving duck species is expected to be very poor from southern Saskatchewan this year.

Some benefits that can come out of drought cycles are subsequent increases in wetland productivity and renewed growth of vegetation in wetlands that were drawdown or dry. The drawback to these periodic dry cycles is that waterfowl populations generally decline and provide less opportunity for consumptive and nonconsumptive users. Also, agricultural interests generally take advantage of the dry conditions and fill in or break up wetland basins resulting in reductions in wetland habitat and wetland quality.

Although June rains have improved conditions of some wetlands, it was too late for the waterfowl in southern Saskatchewan, which generally set up territories during April and May. The lack of wetland habitat during this time moved birds to areas of better habitat. It is doubtful that the improved habitat in June would draw many birds back to these areas that late in the

season. The last drought in southern Saskatchewan occurred in the late 1980s-early 1990s and lasted about 7 years. The outlook based on that information could indicate that southern Saskatchewan is in for another 4 years of low wetland numbers and waterfowl populations.

ACKNOWLEDGMENTS

The survey would be a failure without the continued hard work and cooperation of the Canadian Wildlife Service ground crew, thanks.

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Submitted by: Philip Thorpe
Date: July 3, 2002

Table 1. Survey design and May 2002 coverage for southern Saskatchewan.

	Stratum						
	30	31	32	33	34	35	Total
Survey design:							
Square miles in stratum	18,570	21,086	37,911	11,345	13,164	9,044	111,120
Square miles in sample- waterfowl	153.0	144.0	571.5	90.0	175.5	126.0	1,260.0
Square miles in sample- ponds	76.50	72.00	285.75	45.00	87.75	63.00	630.00
Linear miles in sample	612	576	2,286	360	702	504	5,040
Number of transects in sample	4	5	14	6	5	6	40
Number of segments in sample	34	32	127	20	39	28	280
Expansion factor	121.373	146.431	66.336	126.056	75.009	71.778	
May 2002 coverage:							
Square miles in sample- waterfowl	153.0	144.0	571.5	90.0	128.2	63.0	1,149.7
Square miles in sample- ponds	76.50	72.00	285.75	45.00	64.1	31.5	574.85
Linear miles in sample	612	576	2,286	360	504	252	4,590
Number of transects in sample	4	5	14	6	3	6	38
Number of segments in sample	34	32	127	20	28	14	255
Expansion factor	121.373	146.431	66.336	126.056	102.64	143.56	

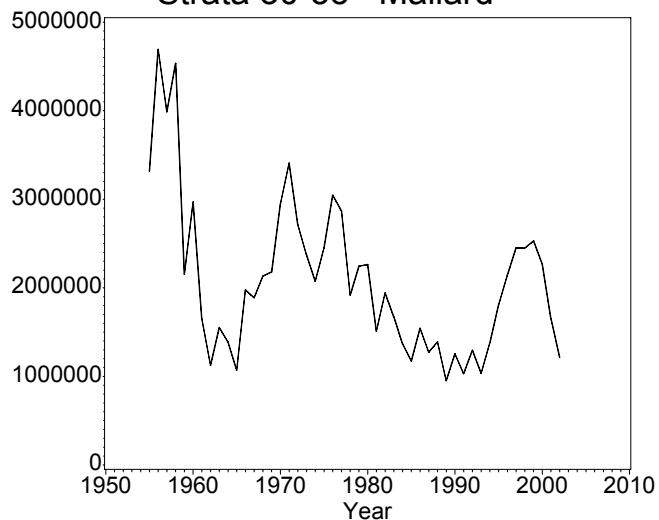
Table 2. Long-term trend in adjusted May pond estimates (thousands) by stratum with comparisons with the previous year, the previous 10-year mean, and the long-term mean for southern Saskatchewan (1961-2002).

Year	Stratum						Total
	30	31	32	33	34	35	
1961	142.2	219.4	252.2	80.3	58.9	41.8	794.9
1962	160.3	383.4	311.1	45.2	269.4	59.9	1229.3
1963	145.0	198.5	268.9	43.3	239.1	129.7	1024.5
1964	196.9	357.3	322.6	64.7	481.8	394.0	1817.2
1965	327.9	439.9	610.1	112.2	435.1	332.2	2257.4
1966	350.8	587.3	595.1	133.0	569.7	388.5	2624.3
1967	282.3	642.1	688.8	194.9	545.1	299.0	2652.2
1968	231.4	329.6	404.2	65.1	123.6	58.5	1212.5
1969	386.7	469.7	781.8	140.0	267.1	179.6	2225.0
1970	278.1	603.7	733.4	102.6	721.3	518.1	2957.1
1971	294.3	407.0	495.3	120.4	608.7	391.7	2317.4
1972	349.1	646.2	357.2	63.1	546.0	302.8	2264.4
1973	266.8	466.6	326.8	85.7	227.6	117.0	1490.4
1974	427.6	836.7	755.0	122.9	943.1	460.9	3546.3
1975	395.3	806.1	785.7	192.7	763.9	480.9	3424.7
1976	201.9	399.0	553.4	96.8	656.6	670.8	2578.5
1977	176.1	254.7	265.7	44.5	338.7	170.3	1250.0
1978	274.1	393.6	566.4	161.6	545.5	280.7	2221.8
1979	433.4	697.5	660.4	130.2	667.8	480.9	3070.1
1980	265.4	311.3	358.2	48.1	273.3	137.2	1393.6
1981	145.9	160.5	126.2	28.4	97.3	52.6	611.0
1982	283.6	629.7	704.5	119.0	247.5	210.4	2194.7
1983	384.9	715.4	711.9	96.0	464.6	323.3	2696.2
1984	283.1	548.3	266.9	35.2	260.3	131.9	1525.8
1985	622.3	737.1	722.9	108.0	560.4	207.8	2958.5
1986	343.8	402.5	615.2	112.8	529.1	346.3	2349.6
1987	223.8	260.9	347.5	150.9	251.5	184.3	1418.9
1988	217.6	378.7	149.1	37.1	213.8	63.4	1059.8
1989	208.1	220.6	222.9	71.1	63.9	73.1	859.7
1990	213.0	284.9	277.1	56.8	453.6	97.4	1382.8
1991	194.8	213.2	437.3	157.1	257.8	144.8	1405.1
1992	247.9	376.4	349.8	34.5	378.3	229.1	1615.9
1993	167.7	189.6	337.3	94.0	203.0	96.3	1087.9
1994	407.3	564.7	742.9	178.0	472.3	288.0	2653.1
1995	344.9	680.9	343.5	52.7	561.0	331.4	2314.4
1996	408.3	666.9	1041.4	197.6	573.0	381.6	3268.9
1997	461.6	497.4	972.1	163.4	578.1	319.5	2992.0
1998	146.5	284.6	345.0	49.3	403.0	241.8	1470.2
1999	313.1	344.4	807.0	93.5	614.9	362.3	2535.3
2000	214.4	272.9	322.5	36.6	348.1	209.2	1403.7
2001	139.7	202.4	378.9	42.0	480.1	292.8	1535.7
2002	72.9	127.4	193.8	68.5	157.3	15.1	634.9
10-year Mean	285.1	408.0	564.0	94.2	461.2	275.2	2087.7
Long-term Mean	281.9	441.0	495.5	96.6	421.8	255.6	1992.5
Percent Change:							
From 2001	-47.8%	-37.1%	-48.9%	63.2%	-67.2%	-94.8%	-58.7%
From 10-year Mean	-74.4%	-68.8%	-65.6%	-27.3%	-65.9%	-94.5%	-69.6%
From Long-term Mean	-74.2%	-71.1%	-60.9%	-29.1%	-62.7%	-94.1%	-68.1%

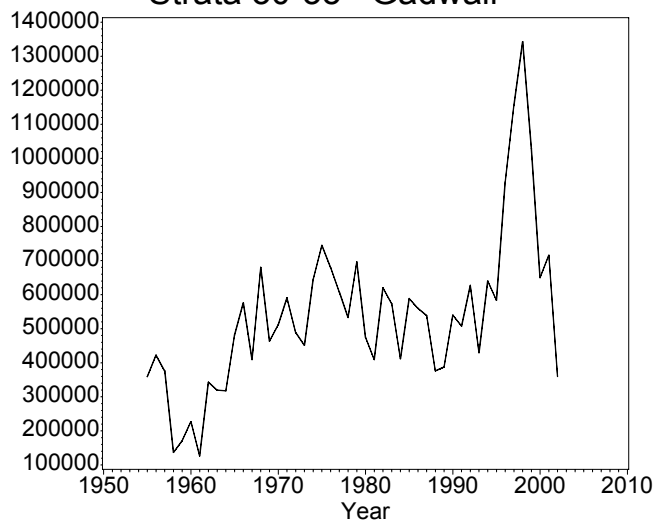
Table 3. Status of waterfowl breeding population estimates (thousands, adjusted for visibility bias) by species and stratum with comparisons with the previous year, the previous 10-year mean, and the long-term mean for southern Saskatchewan, May 2002.

Species/Ponds	Stratum						% Change From						
	30	31	32	33	34	35	2002 Total	2001 Total	10-Year mean	Long- term mean	2001	10-Year mean	Long- term mean
Dabbling ducks													
Mallard	147.9	228.9	301.0	52.3	255.2	227.2	1212.5	1649.7	1900.6	2106.6	-26.5%	-36.2%	-42.4%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2	--	-100.0%	-100.0%
Gadwall	43.0	22.3	148.7	10.2	86.7	48.9	359.7	715.4	810.1	541.3	-49.7%	-55.6%	-33.6%
Am. wigeon	29.0	9.8	72.6	9.6	26.4	27.2	174.5	177.3	295.8	444.1	-1.6%	-41.0%	-60.7%
Am. green-winged teal	31.2	31.0	31.1	1.9	23.6	8.6	127.3	202.3	261.8	230.3	-37.1%	-51.4%	-44.7%
Blue-winged teal	91.5	66.2	190.0	6.9	174.6	137.9	667.1	1267.5	1461.2	1208.0	-47.4%	-54.3%	-44.8%
N. shoveler	27.4	32.3	90.6	8.0	100.7	51.2	310.2	718.1	896.4	620.9	-56.8%	-65.4%	-50.0%
N. pintail	4.5	1.4	60.6	28.5	37.0	49.9	181.8	680.0	653.9	1268.5	-73.3%	-72.2%	-85.7%
Subtotal	374.3	391.8	894.5	117.5	704.2	550.9	3033.2	5410.3	6280.3	6419.9	-43.9%	-51.7%	-52.8%
Diving ducks													
Redhead	12.1	5.7	23.2	5.6	24.0	24.3	94.9	224.3	247.1	190.9	-57.7%	-61.6%	-50.3%
Canvasback	23.3	1.6	17.9	2.0	17.8	10.6	73.3	232.2	211.7	186.2	-68.5%	-65.4%	-60.7%
Scaup	36.0	18.8	50.7	7.7	20.0	16.5	149.7	320.6	378.6	431.2	-53.3%	-60.5%	-65.3%
Ring-necked duck	12.5	2.5	4.3	0.0	1.2	9.1	29.7	36.3	40.9	27.6	-18.3%	-27.4%	7.7%
Goldeneyes	8.9	10.7	0.0	0.0	0.8	1.1	21.4	10.2	39.3	21.6	110.8%	-45.5%	-0.7%
Bufflehead	20.0	32.1	0.3	0.0	10.8	12.1	75.4	73.7	66.4	32.5	2.3%	13.5%	131.7%
Ruddy Duck	2.8	3.4	28.7	0.0	21.9	13.1	70.0	134.3	130.0	97.9	-47.9%	-46.2%	-28.5%
Subtotal	115.6	74.9	125.3	15.3	96.4	86.7	514.2	1031.5	1113.9	987.8	-50.1%	-53.8%	-47.9%
Miscellaneous													
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	--	-100.0%	-100.0%
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.9	3.4	-100.0%	-100.0%	-100.0%
Mergansers	0.8	0.9	1.3	0.0	0.0	0.0	3.0	21.2	6.7	4.9	-86.0%	-56.1%	-39.8%
Subtotal	0.8	0.9	1.3	0.0	0.0	0.0	3.0	21.5	7.8	8.3	-86.2%	-61.9%	-64.5%
Total ducks	490.7	467.6	1021.1	132.8	800.6	637.6	3550.3	6463.3	7402.0	7416.0	-45.1%	-52.0%	-52.1%
Canada goose	45.7	91.3	79.9	10.5	46.4	15.1	288.9	289.1	238.2	88.8	-0.1%	21.3%	225.2%
Am. coot	97.7	41.7	15.8	0.5	55.1	95.9	306.8	679.2	703.8	444.5	-54.8%	-56.4%	-31.0%
Ponds	72.9	127.4	193.8	68.5	157.3	15.1	634.9	1535.7	2087.7	1992.5	-58.7%	-69.6%	-68.1%

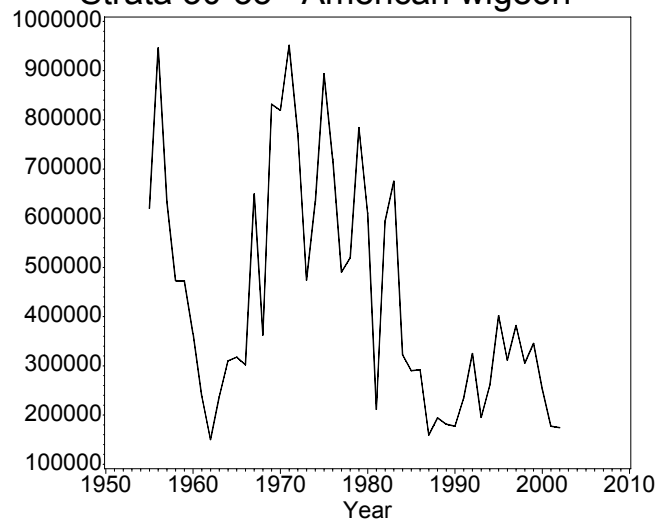
Strata 30-35 Mallard



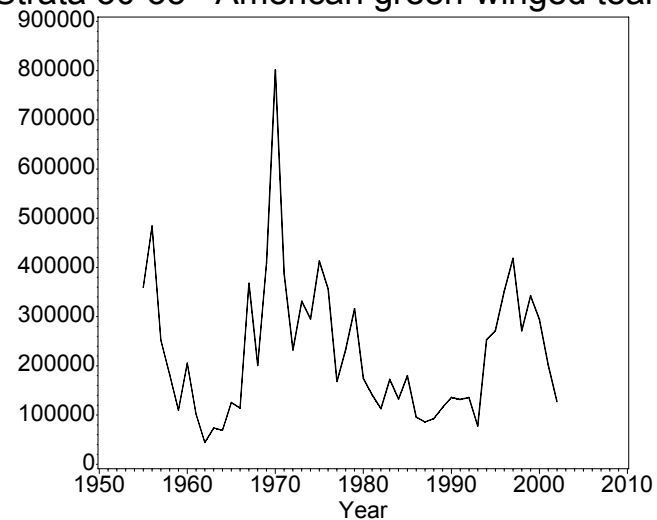
Strata 30-35 Gadwall



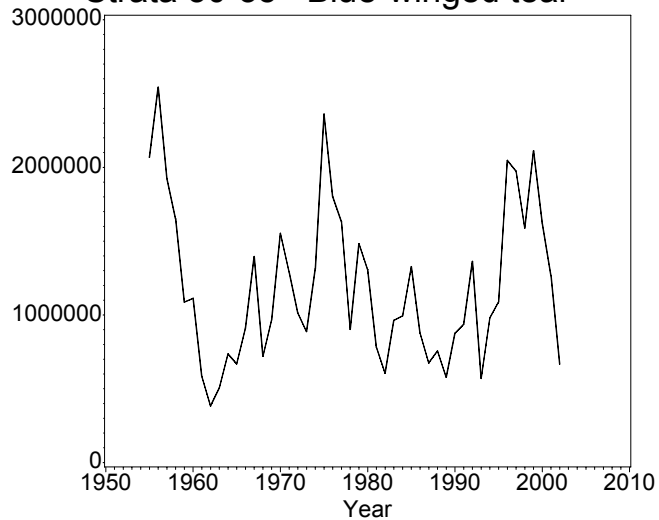
Strata 30-35 American wigeon



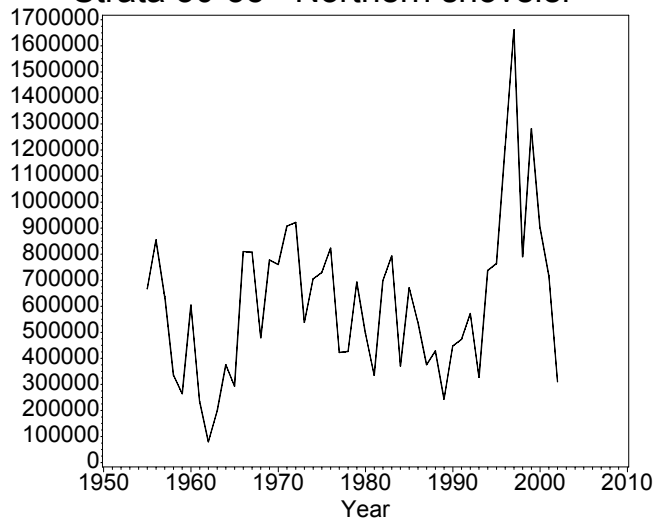
Strata 30-35 American green-winged teal



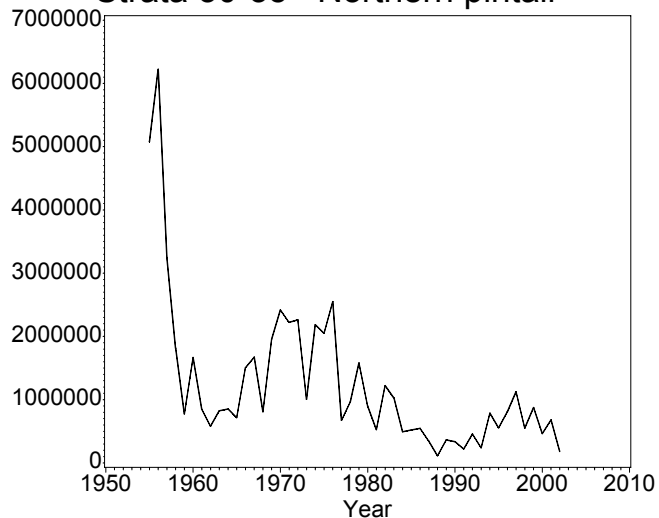
Strata 30-35 Blue-winged teal



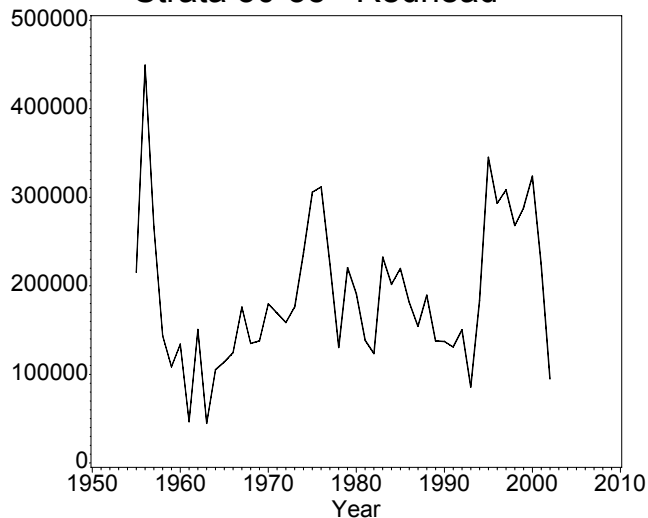
Strata 30-35 Northern shoveler



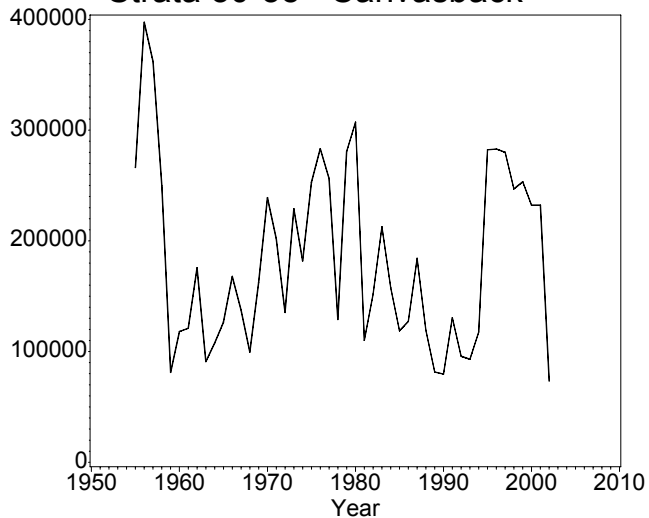
Strata 30-35 Northern pintail



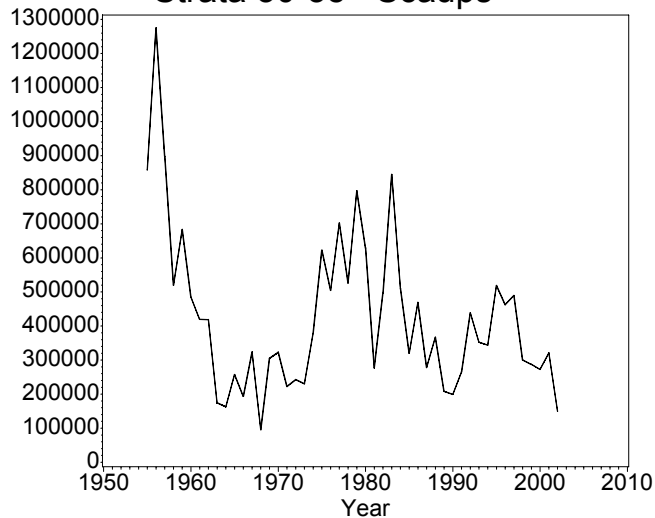
Strata 30-35 Redhead



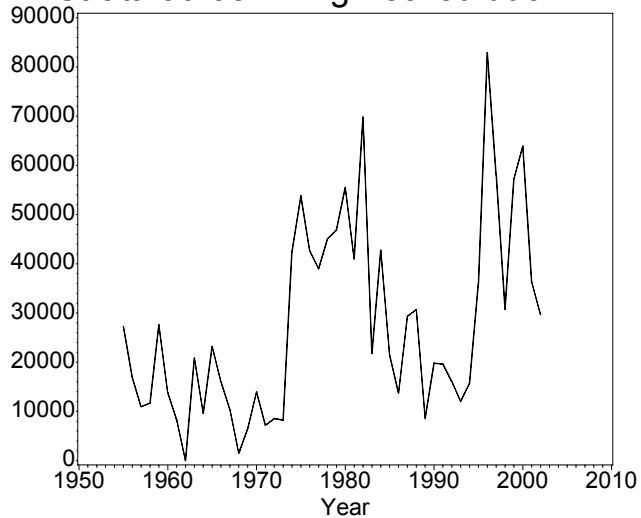
Strata 30-35 Canvasback



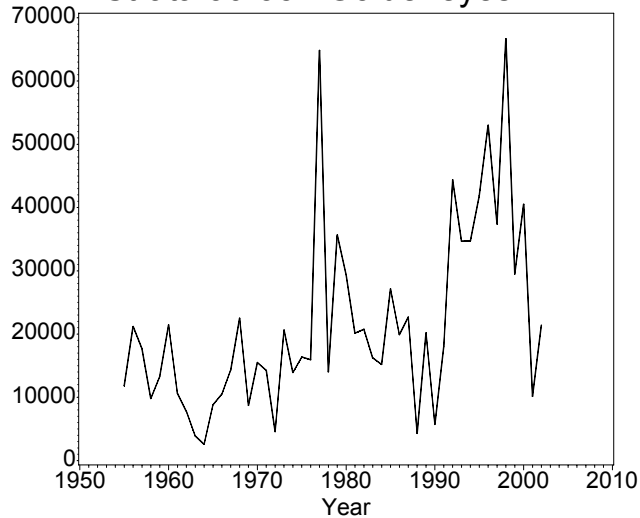
Strata 30-35 Scaups



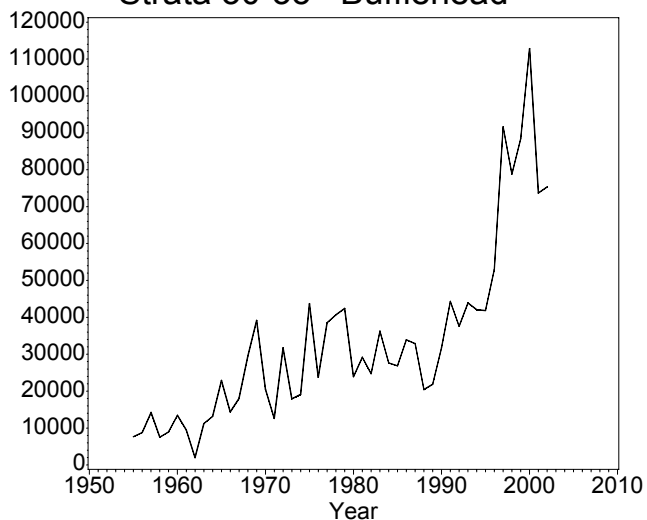
Strata 30-35 Ring-necked duck



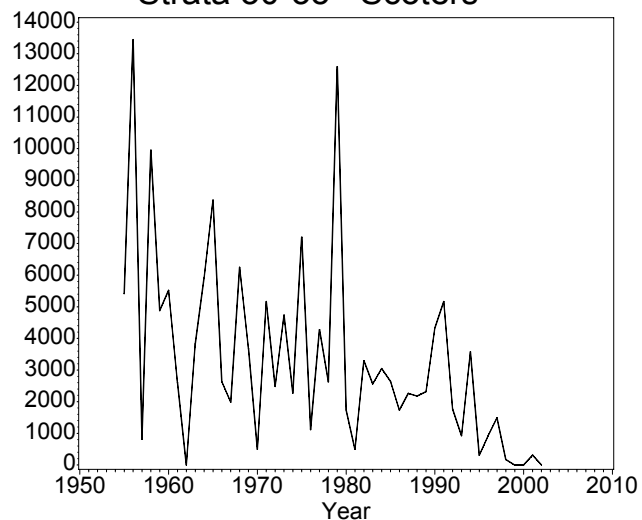
Strata 30-35 Goldeneyes



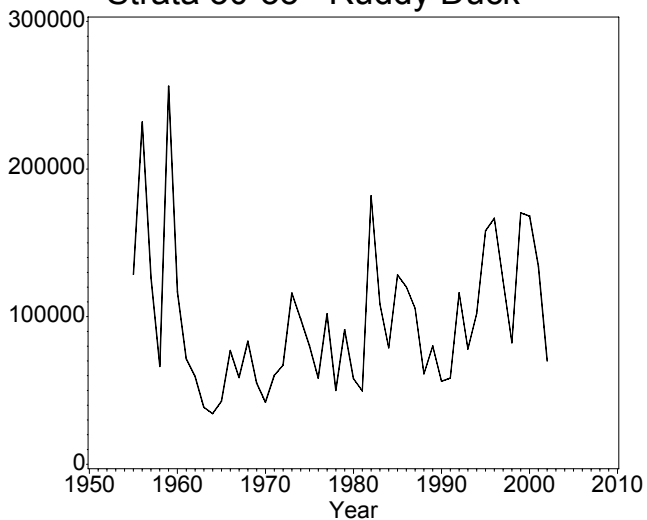
Strata 30-35 Bufflehead



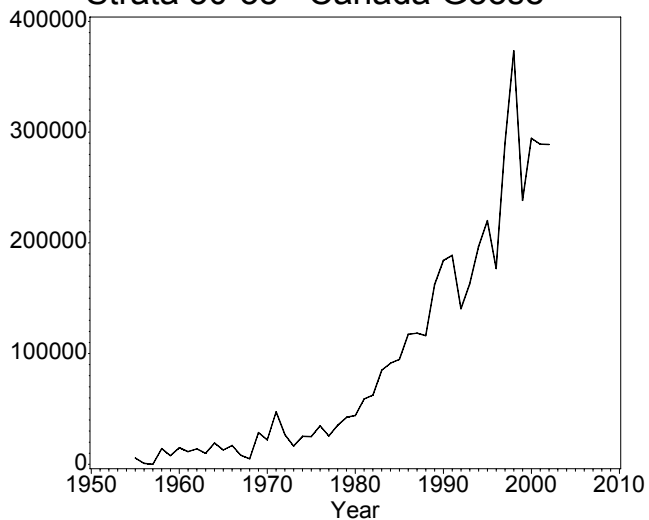
Strata 30-35 Scoters



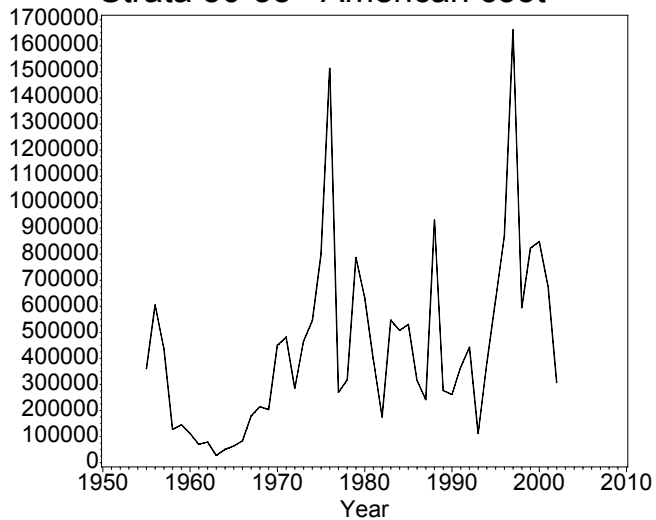
Strata 30-35 Ruddy Duck



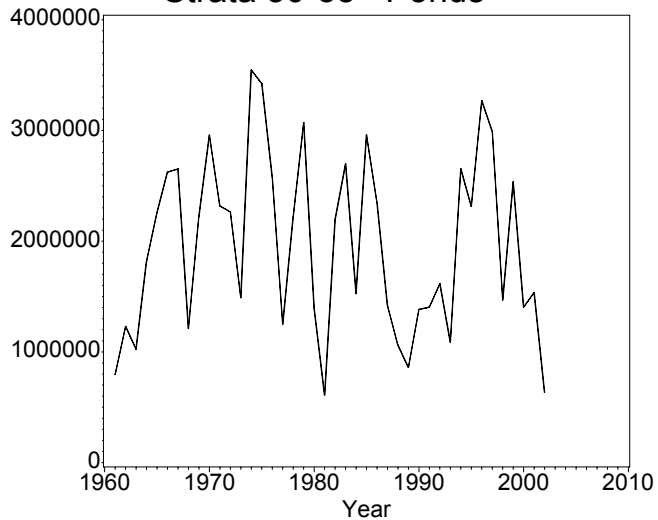
Strata 30-35 Canada Goose



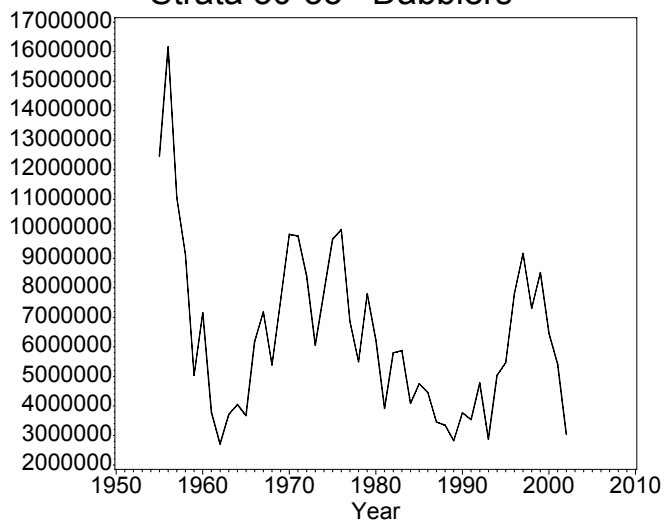
Strata 30-35 American coot



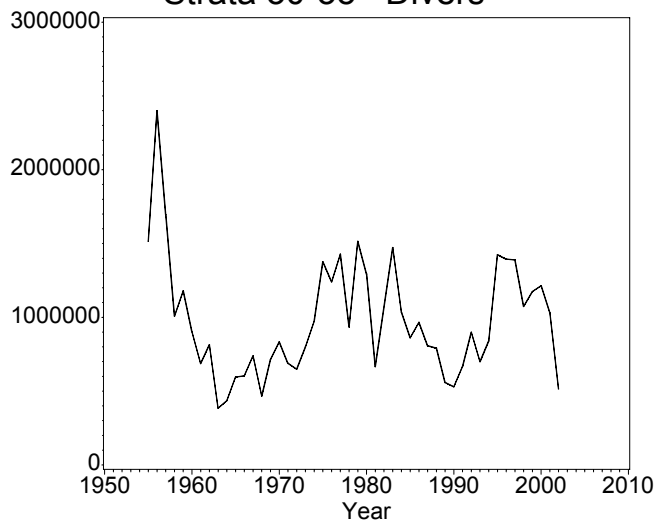
Strata 30-35 Ponds



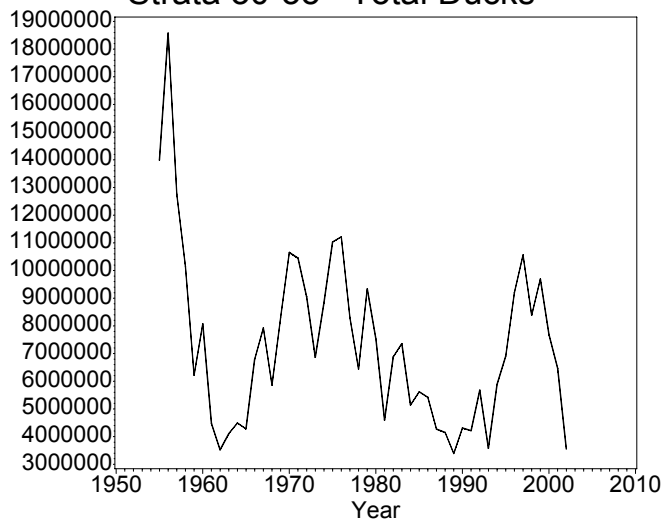
Strata 30-35 Dabblers



Strata 30-35 Divers



Strata 30-35 Total Ducks



Appendix 1. Long-term trend in adjusted waterfowl breeding population estimates (thousands) for southern Saskatchewan.

Species/Ponds	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Dabbling ducks										
Mallard	3317.2	4691.4	3987.9	4534.0	2152.2	2967.5	1649.7	1125.9	1551.4	1387.3
Am. black duck	0.3	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	359.0	422.1	375.7	136.7	171.4	227.0	126.8	342.7	319.4	317.6
Am. wigeon	620.4	946.2	634.0	473.1	472.6	365.2	238.0	150.2	237.3	310.1
Am. green-winged teal	359.6	484.3	252.0	182.3	110.0	205.5	101.7	44.2	73.8	69.1
Blue-winged teal	2068.5	2542.7	1924.3	1650.7	1087.0	1112.8	583.0	383.8	504.9	735.8
N. shoveler	667.1	854.4	637.9	335.4	264.5	604.3	233.9	79.8	196.9	375.3
N. pintail	5076.5	6222.2	3245.9	1813.0	775.0	1665.5	846.7	581.1	823.9	853.4
Subtotal	12468.6	16163.3	11058.3	9125.2	5032.7	7147.9	3779.8	2707.7	3707.6	4048.5
Diving ducks										
Redhead	215.4	449.1	266.8	143.5	108.6	134.2	46.6	150.7	44.6	105.3
Canvasback	266.2	397.4	362.0	249.7	81.2	118.1	121.0	175.7	90.9	107.7
Scaup	858.3	1274.7	898.1	520.0	683.1	484.5	419.5	418.8	174.4	162.9
Ring-necked duck	27.2	16.9	10.9	11.7	27.6	13.8	8.4	0.0	20.8	9.6
Goldeneyes	11.8	21.2	17.7	9.8	13.3	21.4	10.6	7.8	3.9	2.6
Bufflehead	7.6	8.8	14.2	7.5	9.0	13.4	9.5	2.0	11.2	13.2
Ruddy Duck	128.7	231.8	126.1	66.2	256.1	116.8	71.4	59.6	38.5	34.3
Subtotal	1515.3	2399.9	1695.9	1008.4	1178.8	902.1	686.9	814.5	384.4	435.5
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	5.4	13.4	0.8	10.0	4.9	5.5	2.6	0.0	3.8	5.9
Mergansers	0.5	0.0	0.0	0.0	0.4	11.4	2.6	0.0	9.4	2.4
Subtotal	5.9	13.4	0.8	10.0	5.3	16.9	5.2	0.0	13.2	8.3
Total ducks	13989.9	18576.6	12755.0	10143.5	6216.9	8066.8	4471.9	3522.2	4105.2	4492.3
Canada goose	5.6	0.8	0.0	14.2	7.8	15.0	11.4	13.9	9.9	19.2
Am. coot	360.7	604.7	438.8	127.5	145.3	112.0	70.5	79.0	27.4	50.5
Ponds							794.9	1229.3	1024.5	1817.2

Species/Ponds	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Dabbling ducks										
Mallard	1069.9	1975.6	1888.4	2132.2	2180.0	2945.5	3407.2	2711.5	2369.1	2073.8
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Gadwall	481.2	575.4	409.2	679.9	463.5	511.5	590.2	488.8	451.5	644.7
Am. wigeon	317.7	302.1	649.1	362.8	831.7	819.3	951.4	772.3	474.4	633.2
Am. green-winged teal	125.3	114.2	367.7	200.7	408.8	801.4	386.9	232.2	331.2	295.4
Blue-winged teal	669.1	909.7	1395.7	720.2	966.6	1552.6	1291.4	1012.9	887.9	1312.2
N. shoveler	293.6	809.9	807.7	479.4	777.4	760.7	907.7	921.9	538.4	705.2
N. pintail	716.6	1504.8	1671.1	809.2	1956.2	2417.2	2222.0	2261.6	1006.3	2186.0
Subtotal	3673.4	6191.7	7188.9	5384.3	7584.0	9808.1	9757.0	8401.2	6058.7	7850.5
Diving ducks										
Redhead	114.1	124.6	176.0	134.9	137.8	179.6	169.3	158.6	176.3	237.6
Canvasback	126.5	167.8	137.5	99.5	162.4	238.9	202.1	135.3	228.9	181.8
Scaup	257.3	193.5	323.4	95.6	305.0	322.8	222.4	242.6	230.4	377.9
Ring-necked duck	23.2	16.0	10.4	1.5	6.5	13.9	7.2	8.5	8.2	42.6
Goldeneyes	8.8	10.5	14.3	22.5	8.7	15.5	14.3	4.6	20.6	13.9
Bufflehead	22.9	14.4	18.1	29.5	39.2	20.5	12.6	31.7	17.9	19.1
Ruddy Duck	42.6	77.1	58.7	83.3	55.0	42.1	60.2	67.2	116.0	98.5
Subtotal	595.4	603.9	738.3	466.9	714.6	833.4	688.0	648.4	798.3	971.4
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	8.4	2.6	2.0	6.2	3.7	0.5	5.2	2.5	4.7	2.3
Mergansers	5.2	0.0	0.0	1.0	1.4	8.8	1.3	0.0	2.2	0.5
Subtotal	13.6	2.6	2.0	7.2	5.1	9.3	6.4	2.5	6.9	2.7
Total ducks	4282.4	6798.2	7929.2	5858.5	8303.7	10650.8	10451.5	9052.1	6864.0	8824.6
Canada goose	12.8	16.9	8.0	4.9	28.6	22.1	47.3	26.7	16.4	25.2
Am. coot	63.6	83.4	179.0	214.3	203.8	450.3	481.5	284.9	465.9	544.3
Ponds	2257.4	2624.3	2652.2	1212.5	2225.0	2957.1	2317.4	2264.4	1490.4	3546.3

Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) for southern Saskatchewan.

Species/Ponds	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Dabbling ducks										
Mallard	2449.2	3044.7	2869.3	1917.6	2244.2	2263.0	1509.8	1941.1	1670.1	1364.7
Am. black duck	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Gadwall	744.6	679.4	607.5	532.9	695.5	474.6	409.5	619.7	573.3	411.8
Am. wigeon	893.7	720.1	490.7	519.9	784.1	610.4	211.7	594.3	675.0	322.3
Am. green-winged teal	412.8	356.5	168.1	233.9	316.0	174.3	140.9	112.9	172.4	132.7
Blue-winged teal	2360.2	1799.6	1631.3	902.4	1482.8	1307.2	781.5	605.9	963.2	993.6
N. shoveler	730.3	822.9	422.7	426.7	692.4	494.7	335.3	699.0	792.8	370.9
N. pintail	2050.3	2549.6	672.5	961.8	1579.9	897.6	526.2	1222.0	1029.4	492.1
Subtotal	9641.5	9972.8	6862.2	5495.0	7795.1	6221.8	3914.8	5795.0	5876.3	4088.1
Diving ducks										
Redhead	305.7	311.7	224.3	130.3	220.5	190.9	138.4	123.4	232.2	201.6
Canvasback	252.9	283.3	256.5	129.0	280.9	307.2	110.1	151.9	212.7	157.7
Scaup	622.2	504.6	702.2	526.2	796.5	629.0	277.1	496.6	844.8	510.2
Ring-necked duck	53.8	42.6	39.0	45.1	46.8	55.5	41.0	69.8	21.8	42.7
Goldeneyes	16.4	15.9	64.8	14.0	35.7	29.4	20.1	20.8	16.2	15.2
Bufflehead	43.7	23.8	38.5	40.7	42.4	23.9	29.2	24.7	36.2	27.6
Ruddy Duck	80.3	58.4	101.8	50.0	91.1	57.9	49.7	181.9	108.5	78.9
Subtotal	1374.9	1240.3	1427.2	935.2	1514.0	1293.8	665.7	1069.1	1472.5	1033.8
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	7.2	1.1	4.3	2.6	12.6	1.7	0.5	3.3	2.6	3.0
Mergansers	7.5	5.3	3.4	6.5	13.0	6.8	14.6	3.4	5.9	17.7
Subtotal	14.7	6.4	7.6	9.1	25.6	8.6	15.0	6.7	8.5	20.8
Total ducks	11031.1	11219.5	8297.0	6439.4	9334.7	7524.2	4595.6	6870.8	7357.3	5142.7
Canada goose	25.0	34.8	25.6	35.3	42.4	44.0	59.0	62.5	85.0	91.3
Am. coot	799.8	1513.0	269.4	317.8	787.2	634.2	395.1	175.4	546.7	507.4
Ponds	3424.7	2578.5	1250.0	2221.8	3070.1	1393.6	611.0	2194.7	2696.2	1525.8

Species/Ponds	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Dabbling ducks										
Mallard	1173.3	1542.6	1273.3	1389.2	951.7	1253.7	1031.1	1293.4	1036.4	1380.3
Am. black duck	0.0	0.0	0.9	0.0	0.0	0.0	0.5	0.3	0.0	0.0
Gadwall	588.4	559.9	539.1	376.2	387.9	539.5	507.7	626.9	429.6	639.8
Am. wigeon	290.1	292.3	159.4	194.1	181.4	177.3	234.3	324.9	195.2	261.0
Am. green-winged teal	179.9	95.9	85.8	92.7	115.5	135.7	131.8	135.6	77.8	253.2
Blue-winged teal	1327.3	876.5	674.8	755.3	578.4	875.5	936.7	1362.4	570.1	980.2
N. shoveler	671.0	538.8	375.8	428.3	243.8	447.8	473.4	571.9	327.4	737.5
N. pintail	520.6	545.9	343.8	113.8	363.7	336.7	221.0	456.9	240.4	785.2
Subtotal	4750.7	4451.8	3453.1	3349.6	2822.5	3766.1	3536.4	4772.4	2876.8	5037.1
Diving ducks										
Redhead	219.6	181.6	154.3	189.3	137.8	137.2	131.1	150.3	85.7	183.5
Canvasback	118.8	127.2	184.2	119.0	81.5	79.7	130.5	95.7	93.0	117.7
Scaup	319.8	468.9	278.2	366.9	208.1	199.3	265.4	438.6	352.1	343.9
Ring-necked duck	21.4	13.7	29.3	30.7	8.6	19.8	19.6	16.1	12.0	15.7
Goldeneyes	27.1	19.9	22.7	4.3	20.2	5.7	18.0	44.4	34.7	34.8
Bufflehead	26.9	33.9	32.9	20.4	21.9	31.7	44.3	37.6	43.9	42.1
Ruddy Duck	128.3	120.2	105.6	61.2	80.1	56.2	58.5	116.1	78.1	102.2
Subtotal	861.8	965.5	807.1	791.9	558.2	529.7	667.4	898.7	699.5	839.8
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	2.6	1.7	2.3	2.2	2.3	4.3	5.2	1.8	0.9	3.6
Mergansers	1.9	0.0	6.9	5.8	3.7	7.9	6.5	3.8	3.5	2.3
Subtotal	4.5	1.7	9.1	8.0	6.0	12.3	11.6	5.6	4.8	6.5
Total ducks	5617.0	5419.1	4269.3	4149.5	3386.6	4308.1	4215.4	5676.7	3581.0	5883.3
Canada goose	94.7	117.3	118.4	116.2	162.2	184.0	188.7	140.5	163.1	196.6
Am. coot	530.6	315.0	241.7	930.7	276.2	261.5	366.6	442.6	111.8	383.3
Ponds	2958.5	2349.6	1418.9	1059.8	859.7	1382.8	1405.1	1615.9	1087.9	2653.1

Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) for southern Saskatchewan.

Species/Ponds	1995	1996	1997	1998	1999	2000	2001	2002
Dabbling ducks								
Mallard	1808.5	2142.7	2450.8	2448.7	2528.6	2266.7	1649.7	1212.5
Am. black duck	0.4	0.0	0.0	3.3	0.4	0.4	0.0	0.0
Gadwall	583.6	930.1	1155.3	1342.0	1028.7	650.0	715.4	359.7
Am. wigeon	401.8	311.8	381.9	305.5	345.5	253.1	177.3	174.5
Am. green-winged teal	271.3	351.2	418.5	271.2	342.2	294.8	202.3	127.3
Blue-winged teal	1088.4	2046.6	1974.4	1589.0	2110.9	1622.4	1267.5	667.1
N. shoveler	763.9	1212.8	1660.7	790.5	1281.3	899.8	718.1	310.2
N. pintail	554.2	807.4	1123.9	551.8	875.2	463.6	680.0	181.8
Subtotal	5472.2	7802.8	9165.4	7302.2	8512.9	6450.9	5410.3	3033.2
Diving ducks								
Redhead	345.1	293.2	308.5	268.1	288.3	323.8	224.3	94.9
Canvasback	282.3	283.0	280.1	246.9	253.4	232.2	232.2	73.3
Scaup	518.6	462.5	489.5	300.2	287.4	272.8	320.6	149.7
Ring-necked duck	36.0	82.9	58.1	30.8	57.2	63.9	36.3	29.7
Goldeneyes	41.9	53.0	37.4	66.7	29.5	40.5	10.2	21.4
Bufflehead	41.9	53.0	91.6	78.8	88.4	112.8	73.7	75.4
Ruddy Duck	158.1	166.7	124.1	82.3	170.3	168.2	134.3	70.0
Subtotal	1423.9	1394.2	1389.2	1073.7	1174.5	1214.2	1031.5	514.2
Miscellaneous								
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.3	0.9	1.5	0.2	0.0	0.0	0.3	0.0
Mergansers	7.5	4.0	6.5	6.8	2.6	9.2	21.2	3.0
Subtotal	7.9	4.9	7.9	6.9	2.6	9.2	21.5	3.0
Total ducks	6903.9	9201.9	10562.5	8382.9	9690.0	7674.2	6463.3	3550.3
Canada goose	220.0	176.8	289.6	373.3	238.4	294.4	289.1	288.9
Am. coot	625.2	868.1	1661.1	594.3	823.7	848.5	679.2	306.8
Ponds	2314.4	3268.9	2992.0	1470.2	2535.3	1403.7	1535.7	634.9